

Amendments to the Claims

The following Listing of Claims replaces all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (currently amended): A method of topographically mapping a surface, comprising:

directing a radiation beam toward a target location on the surface;

capturing an image of a beam spot at a location in an image plane intersecting at least a portion of the radiation beam reflected from the target location on the surface;

identifying ~~at least one image plane coordinate for~~ a peripheral point of the beam spot image;

determining at least one coordinate in the image plane corresponding to the identified peripheral point; and

assigning a relative height value to the target location based on a mapping of the at least one image plane coordinate ~~identified for the peripheral beam spot point~~ to the relative height value.

Claim 2 (original): The method of claim 1, wherein the radiation beam is directed along a beam axis and an image plane coordinate is identified with respect to a first direction substantially parallel to a projection of the beam axis onto the image plane.

Claim 3 (currently amended): A method of topographically mapping a surface, comprising:

directing a radiation beam toward a target location on the surface, wherein the radiation beam is directed along a beam axis;

capturing an image of a beam spot at a location in an image plane intersecting at least a portion of the radiation beam reflected from the target location on the surface;

identifying at least one image plane coordinate for a peripheral point of the beam spot image~~The method of claim 2, wherein the peripheral point is located at a peripheral area of~~

~~the beam spot closer to the beam axis than other comparable peripheral areas of the beam~~

spot and an image plane coordinate is identified with respect to a first direction substantially parallel to a projection of the beam axis onto the image plane; and
assigning a relative height value to the target location based on a mapping of the at least one image plane coordinate identified for the peripheral beam spot point to the relative height value.

Claim 4 (currently amended): The method of claim 1, wherein the identifying the at least one image plane coordinate comprises applying a threshold to pixel values of the beam spot image to identify the peripheral point.

Claim 5 (currently amended): The method of claim 4, wherein a normalized grayscale threshold is applied to the pixel values of the beam spot image to identify the peripheral point.

Claim 6 (currently amended): The method of claim 1, wherein the assigning a of the relative height value to the target location comprises mapping the at least one image plane coordinate to a predetermined relative height value.

Claim 7 (original): The method of claim 6, wherein the at least one image plane coordinate is mapped to the predetermined relative height value based on a lookup table.

Claim 8 (original): The method of claim 1, wherein the surface forms a boundary of a substrate and is semitransparent with respect to the radiation beam.

Claim 9 (original): The method of claim 8, wherein the substrate is a printed circuit board.

Claim 10 (currently amended): The method of claim 9, further comprising repeating the steps of directing, capturing, identifying, determining, and assigning for a plurality of target location on the surface of the printed circuit board arranged in a prescribed triangular mesh pattern.

Claim 11 (original): A system for topographically mapping a surface, comprising:
a radiation source oriented to direct a radiation beam toward a target location on the surface;
an imager oriented to capture an image of a beam spot at a location in an image plane intersecting at least a portion of the radiation beam reflected from the target location on the surface;
a mapping engine operable to identify ~~at least one image plane coordinate for a peripheral point of the beam spot image, determine at least one coordinate in the image plane corresponding to the identified peripheral point, and to assign a relative height value to the target location based on a mapping of the at least one image plane coordinate identified for the peripheral beam spot point to the relative height value.~~

Claim 12 (currently amended): The system of claim 11, wherein the radiation source is oriented to direct the radiation beam along a beam axis, and the mapping engine is operable to identify ~~an image~~ an image plane coordinate with respect to a first direction substantially parallel to a projection of the beam axis onto the image plane.

Claim 13 (currently amended): A system for topographically mapping a surface, comprising:

a radiation source oriented to direct a radiation beam along a beam axis toward a target location on the surface;

an imager oriented to capture an image of a beam spot at a location in an image plane intersecting at least a portion of the radiation beam reflected from the target location on the surface;

a mapping engine operable to identify at least one image plane coordinate for a peripheral point of the beam spot image, and to assign a relative height value to the target location based on a mapping of the at least one image plane coordinate identified for the peripheral beam spot point to the relative height value
The system of claim 12, wherein the peripheral beam spot point is located at a peripheral area of the beam spot closer to the beam axis than other comparable peripheral areas of the beam spot and the mapping engine is operable to identify an image plane coordinate with respect to a first direction substantially parallel to a projection of the beam axis onto the image plane.

Claim 14 (currently amended): The system of claim 11, wherein the mapping engine is operable to identify the ~~image plane coordinates~~ peripheral point by applying a threshold to pixel values of the beam spot image.

Claim 15 (currently amended): The system of claim 14, wherein the mapping engine is operable to apply a normalized grayscale threshold to the pixel values of the beam spot image to identify the peripheral point.

Claim 16 (original): The system of claim 11, wherein the mapping engine is operable to assign a relative height value to the target location by mapping the at least one image plane coordinate to a predetermined relative height value.

Claim 17 (original): The system of claim 16, wherein the mapping engine is operable to map the at least one image plane coordinate to the predetermined relative height value based on a lookup table.

Claim 18 (currently amended): A computer program for topographically mapping a surface, the computer program residing on a computer-readable medium and comprising computer-readable instructions for causing a computer to:

~~identify at least one image plane coordinate for a peripheral point of a beam spot image captured at an image plane intersecting at least a portion of radiation beam reflected from a target location on the surface;~~

determine at least one coordinate in the image plane corresponding to the identified peripheral point; and

assign a relative height value to the target location based on a mapping of the at least one image plane coordinate ~~identified for the peripheral beam spot point~~ to the relative height value.

Claim 19 (currently amended): A computer program for topographically mapping a surface, the computer program residing on a computer-readable medium and comprising computer-readable instructions for causing a computer to:

identify at least one image plane coordinate for a peripheral point of a beam spot image captured at an image plane intersecting at least a portion of radiation beam reflected from a target location on the surface~~The computer program of claim 18~~, wherein an image plane coordinate is identified with respect to a first direction substantially parallel to a projection onto the image plane of a beam axis of a radiation beam directed toward the target location, and the peripheral beam spot point is located at a peripheral area of the beam spot closer to the beam axis than other comparable peripheral areas of the beam spot; and assign a relative height value to the target location based on a mapping of the at least one image plane coordinate identified for the peripheral beam spot point to the relative height value.

Claim 20 (currently amended): The computer program of claim 18, wherein the computer-readable instructions identify the peripheral beam spot point~~the at least one image plane coordinate is identified~~ by applying a threshold to pixel values of the beam spot image.

Claim 21 (new): The method of claim 1, wherein the identifying comprises applying a threshold to pixel values of the beam spot image to identify a peripheral point of the beam spot image that corresponds to a highest point of reflection from the target location as the peripheral point.